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Frame for spinal fixation - has rectangular stainless steel frame with shorter slides bent in same directions
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Abstract (Basic): EP 146347 A

The support for spinal fixation has a rod of biocompatible material formed into a rigid rectangular frame. The shorter sides (11) are bent in the same direction from the plane of the longer sides (12). The shorter sides each have two straight portions (13) at an angle to each other of between 90 and 110 degrees, with a small radius curve (14) between them and small radius curves (15) at the corners formed with the longer sides.

There can be at least one cross-bar (17) between the longer sides (12), the cross-bar being bent similarly to the shorter sides and in the same direction.

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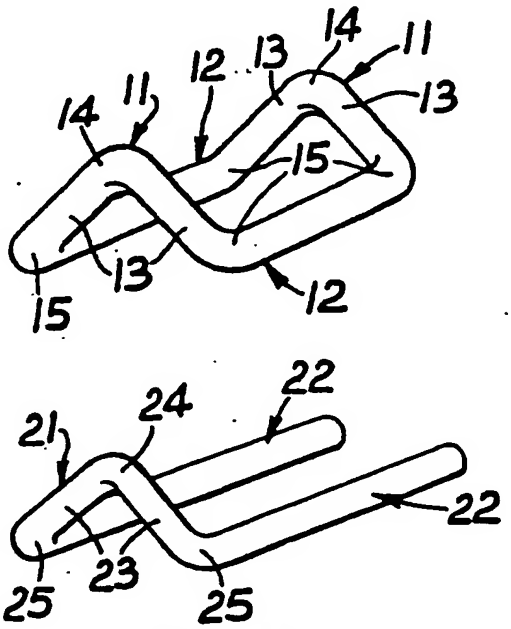
(54) Devices for spinal fixation.

(57) A spinal fixation device (Fig. 1) of the type consisting of rod of biocompatible material (e.g. stainless steel) formed into a rigid rectangle has its shorter sides (11) bent in the same direction from the plane of the longer sides (12) to fit more closely upon the spine than the known flat rectangle, each shorter side (11) having two straight portions (13) at an angle to each other of between 90° and 110°, with a small radius curve (14) between them and small radius curves (15) at the corners formed with the longer sides (12).

A fixation device (Fig. 8) for use on the spine of an infant or juvenile consists of similar rod formed into a rigid U-shape with a base portion (21) similar to the shorter sides (11) of the rectangle, i.e. bent from the plane of the sides (22) of the U, so that when the sides (22) are wired to the spine the wires can slide along the sides (22), to allow for growth of the spine whilst maintaining support therefor.



EP 0 146 347 A2

DEVICES FOR SPINAL FIXATION

This invention relates to devices for spinal fixation, of which one known type consists of stainless steel round rod formed by bending and homogeneously welding into a rectangle adapted to fit neatly on the posterior surface of the spine and embrace two or more bones between its shorter sides with its longer sides substantially parallel to the length of the bones, the rectangle being fixed in place to immobilise the embraced bones with respect to each other by means of wires around or looped through the rectangle and passing through holes in the bones.

The object of the invention is to provide improved devices for spinal fixation.

According to one aspect of the present invention, a device for spinal fixation consists of rod of biocompatible material formed into a rigid rectangle with its shorter sides bent (e.g. into or including a curve) in the same direction from the plane of the longer sides.

The bending (and/or curving) of the shorter sides enables the "roofed" rectangle to fit more closely upon the spine than the

previously "flat" rectangle and therefore it appears less bulky. This reduces dead spaces between the device and the spine, thus effectively reducing the risk of haematoma and infection, whilst being biomechanically more efficient. Correct fixing of the "roofed" rectangle is more consistently obtained because wires or other strands looped through the rectangle round the shorter sides are automatically guided down the "slopes" of the shorter sides to rest at the corners formed with the longer sides. Furthermore, because the "roofed" rectangle makes a better fit and affords greater inherent torsional rigidity than a flat rectangle, it gives much greater control of rotation of the immobilised bones with respect to the remainder of the spine.

The "roofed" rectangle is the first implanted device to give the spine effective torsional rigidity, therefore allowing immediate mobilisation following surgery, without the need of any external cast or brace.

The shorter sides preferably lie in parallel planes, perpendicular to the plane of the longer sides, and each shorter side

preferably has two straight portions, at an angle to each other of between 90° and 110°, with a small radius curve between them and small radius curves at the corners formed with the longer sides. Thus the "roofed" rectangle may be formed of 3/16" diameter stainless steel rod with radiused curves and homogeneously joined, but it may alternatively be formed of titanium rod.

A "roofed" rectangle of appreciable length may be provided with at least one crossbar between the longer sides, the crossbar being bent similarily to the shorter sides and in the same direction. Such a crossbar may have tubular ends slidable along the longer sides, to allow for adjustment to suit intermediate bones.

Any of the sides of the "roofed" rectangle, or a crossbar thereon, may be provided with at least one integral pierced lug or "eye" for a fixation screw or pin.

In addition to providing "roofed" rectangles of different lengths and/or widths, the shorter sides may have different "roof" angles, to suit different sizes of bones and/or bone combinations.

According to another aspect of the present invention, a device for spinal fixation consists of rod of biocompatible material formed into a rigid U-shape with a base portion shorter than parallel sides of the U, and with the base portion bent (e.g. into or including a curve) from the plane of the sides.

The bending (and/or curving) of the base portion of the U enables it to fit closely at one position on a spine of an infant or juvenile and be wired thereto, whilst the sides of the U extend parallel to the spine, which may be wired or tied with other strands slidably thereto, or to at least one crossbar bent (and/or curved) similarly to and in the same direction as the base portion of the U between parallel tubular portions slidable along the sides of the U, to allow for growth of the spine whilst maintaining support therefor.

The base portion of the U preferably has two straight portions at an angle to each other of between 90° and 110°, with a small radius curve between them and small radius curves at the corners formed with the sides of

the U Thus the "roofed" U may be formed of 3/16" diameter stainless steel rod with radiussed curves, and has the advantage of not requiring any welding, but it may alternatively be formed of titanium rod.

In addition to providing "roofed" U's of different lengths and/or widths, the base portions may have different "roof" angles, to suit different sizes of bones and/or bone combinations.

Either of the sides or the base of the "roofed" U, or a crossbar slidable thereon, may be provided with at least one integral pierced lug or "eye" for a fixation screw or pin.

A number of embodiments of the invention will now be described, by way of example only, with reference to the accompanying drawings, in which:-

Figures 1 and 2 are perspective views of two sizes of rectangular spinal fixation device in accordance with the invention;

Figure 3 is a perspective view showing a similar but even longer rectangular spinal fixation device than in Figure 2 wired in place to the sacrum and adjacent lumbar

vertebrae;

Figure 4 is a fragmentary side elevation of Figure 3 to a slightly larger scale;

Figure 5 is a section from the line V-V of Figure 4;

Figure 6 is a perspective view of another rectangular spinal fixation device in accordance with the invention having two fixed intermediate crossbars;

Figure 7 is a plan of a rectangular spinal fixation device similar to that of Figure 2 but having integral pierced lugs or "eyes";

Figure 8 is a perspective view of a U-shaped spinal fixation device in accordance with the invention;

Figure 9 corresponds to Figure 8 but shows a U-shaped spinal fixation device provided with an adjustable sliding crossbar; and

Figure 10 also corresponds to Figure 8 but shows two slidable crossbars.

The spinal fixation devices shown in Figures 1 to 5 each consist of rod of biocompatible material (e.g., stainless steel

or titanium of 3/16" diameter) formed into a rigid rectangle with its shorter sides 11 bent in the same direction from the plane of the longer sides 12. The shorter sides 11 lie in parallel planes perpendicular to the plane of the longer sides 12, and each shorter side 11 has two straight portions 13 at an angle to each other of 100°, with a small radius curve 14 between them and small radius curves 15 at the corners formed with the longer sides.

The bending and curving of the shorter sides 11 enables such a "roofed" rectangle to fit more closely upon the spine than a "flat" rectangle and therefore it appears less bulky, as will be appreciated from reference to Figures 4 and 5, thus reducing dead spaces between the device and the spine, with accompanying reduction in the risk of haematoma and infection. Correct fixing of the "roofed" rectangles is more consistently obtained because wires 16 (or other strands) looped through the rectangle round the shorter sides 11 are automatically guided down the "slopes" 13 of the shorter sides to rest at the corners 15 formed with the longer sides 12. Furthermore, as will also be appreciated

from reference to Figures 4 and 5, because the "roofed" rectangles make a better fit and afford greater inherent torsional rigidity than flat rectangles, they give much geater control rotation of the immobilised bones with respect to the remainder of the spine.

In Figurs 3 and 4 the longer sides 12 of the rectangle are shown having been bent to a slight curvature to match the curvature of the spine, and has further wires 16X (or other strands) looped through the rectangle at intermediate positions along the longer sides.

In Figure 6 a "roofed" rectangle of greater length than those of Figures 1 and 2, and comparable with that of Figures 3 and 4, is provided with a pair of fixed crossbars 17 between the longer sides 12, the crossbars being bent similarly to the shorter sides 11 and in the same direction.

The "roofed" rectangle shown in Figure 7 is similar to that of Figure 2 but is provided with a pierced lug or "eye" 18 integral with one longer side 12 and a pair of pierced lugs or "eyes" 18X integral with one shorter side, for additional fixing by means of fixation screws or pins (not shown).

The spinal fixation device shown in Figure 8 consists of rod of biocompatible material (e.g., stainless steel or titanium of 3/16" diameter) formed into a rigid U-shape with a base portion 21 shorter than parallel sides 22 of the U, and with the base portion 21 bent in a plane perpendicular to the plane of the sides 22, with two straight portions 23 at an angle to each other of 100°, with a small radius curve 24 between them and small radius curves 25 at the corners formed with the sides 22.

The bending of the base portion 21 of the U enables it to fit closely at one position on a spine (not shown) of an infant or juvenile and be wired thereto, whilst the sides 22 of the U extend parallel to the spine, being slidably wired thereto to allow for growth of the spine whilst maintaining support therefor.

Alternatively, as shown in Figure 9, a crossbar 27 bent similarly to and in the same direction as the base portion 21 of the U may be provided between parallel tubular portions 26 slidable along the sides 22 of the U. Or again, as shown in Figure 10, two slidable

crossbars may be provided by having one crossbar 27X provided with tubular portions 26X open at each end, the other crossbar 27Y being formed by a U-shaped member similar to the basic U-shaped fixation device, with the sides 22Y slidable in the opposite ends of the tubular portions 26X to the sides 22 of the basic fixation device.

CLAIMS

1. A device for spinal fixation consisting of rod of biocompatible material formed into a rigid rectangle, charterised in that its shorter sides (11) are bent in the same direction from the plane of the longer sides (12).

2. A device as in Claim 1, characterised in that the shorter sides (11) the shorter sides lie in parallel planes perpendicular to the plane of the longer sides (12).

3. A device as in Claim 1 or Claim 2, characterised in that each shorter side (11) has two straight portions (13) at an angle to each other of between 90° and 110°, with a small radius curve (14) between them and small radius curves (15) at the corners formed with the longer sides (12).

4. A device as in any one of Claims 1 to 3, characterised in that with at least one crossbar (17) between the longer sides (12), the crossbar (17) being bent similarly to the shorter sides (11) and in the same direction.

5. A device for spinal fixation characterised by of rod of biocompatible

material formed into a rigid U-shape with a base portion (21) shorter than parallel sides (22) of the U, and with the base portion (21) bent from the plane of the sides (22).

6. A device as in Claim 5, characterised in that the base portion (21) of the U has two straight portions (23) at an angle to each other of between 90° and 110°, with a small radius curve (24) between them and small radius curves (25) at the corners formed with the sides (22) of the U.

7. A device as in Claim 5 or Claim 6, characterised in that at least one crossbar (27) bent similar to and in the same direction as the base portion (21) of the U between parallel tubular portions (26) slidable along the sides (22) of the U.

8. A device as in any one of Claims 1 to 7, characterised in that with at least one integral pierced lug.

9. A device as in any one of Claims 1 to 8, characterised in that formed of stainless steel rod.

10. A device as in any one of Claims 1 to 8, characterised in that formed of titanium rod.

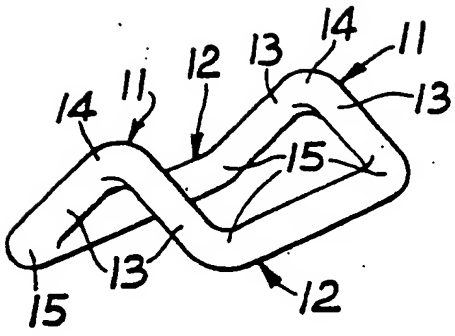


Fig. 1

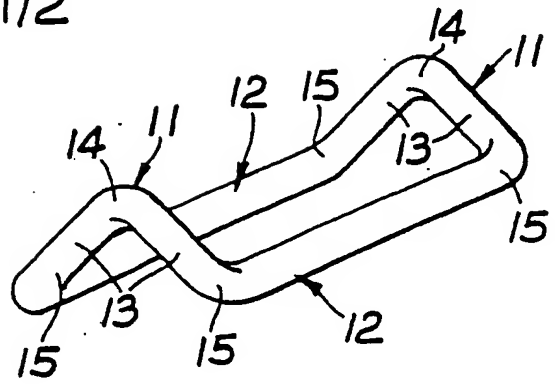


Fig. 2

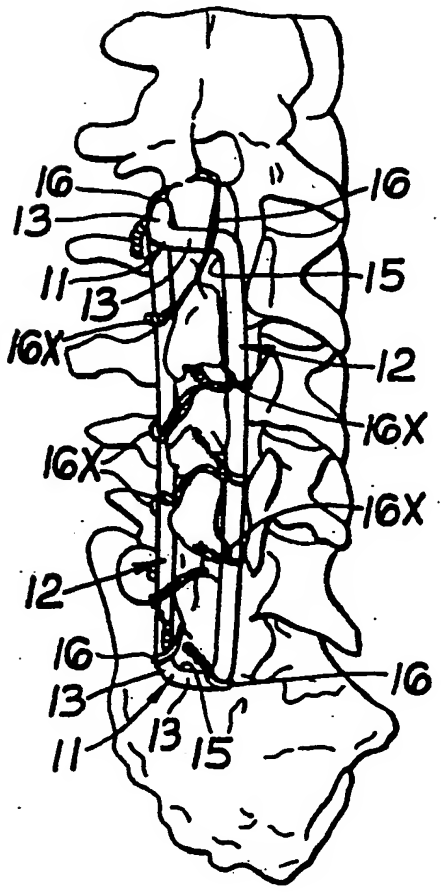


Fig. 3

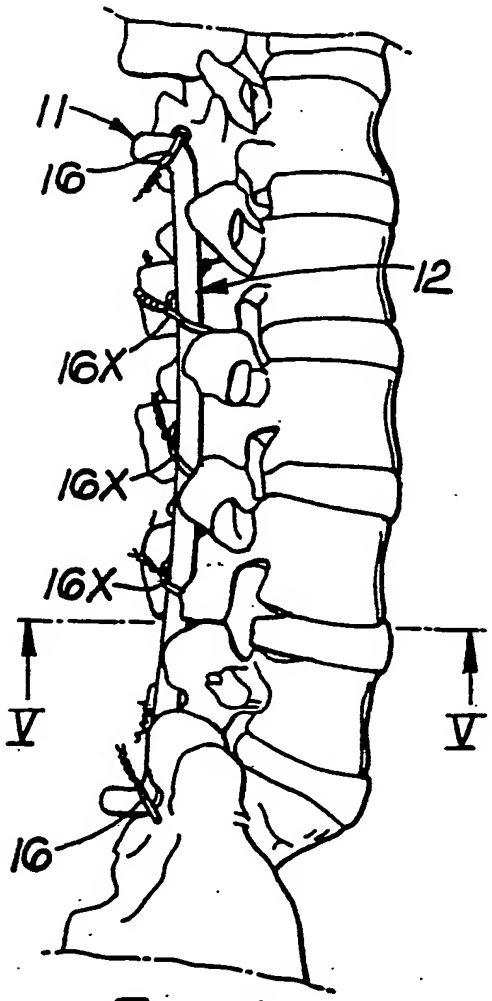


Fig. 4

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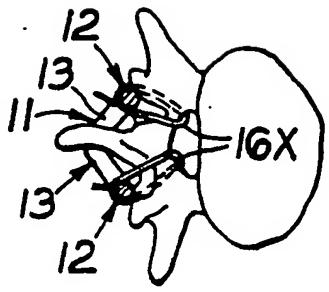

Fig. 5

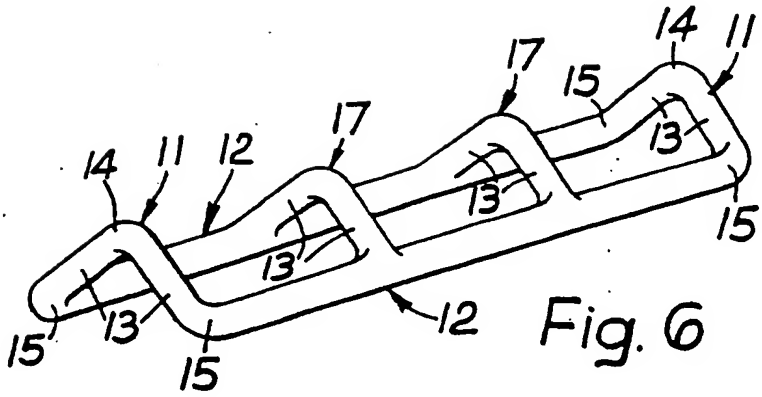

Fig. 6

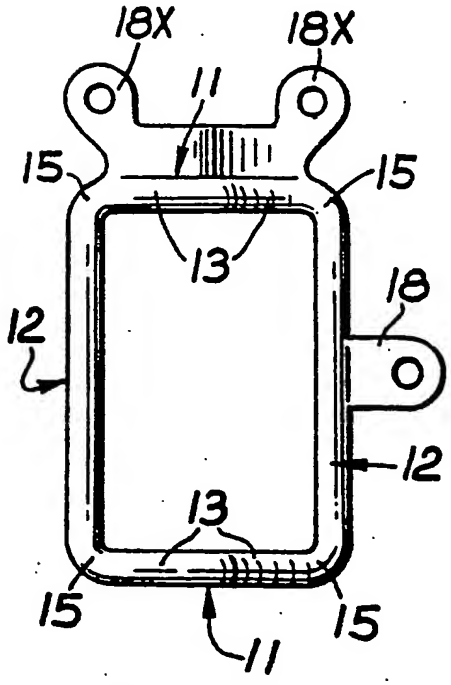

Fig. 7

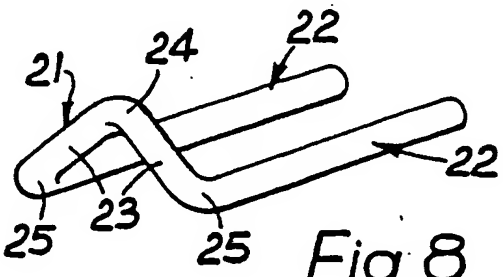

Fig. 8

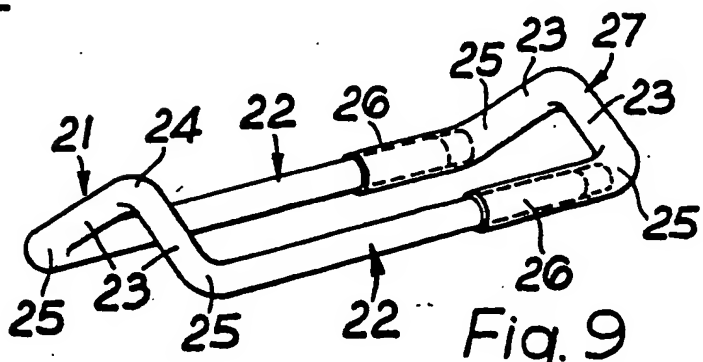

Fig. 9

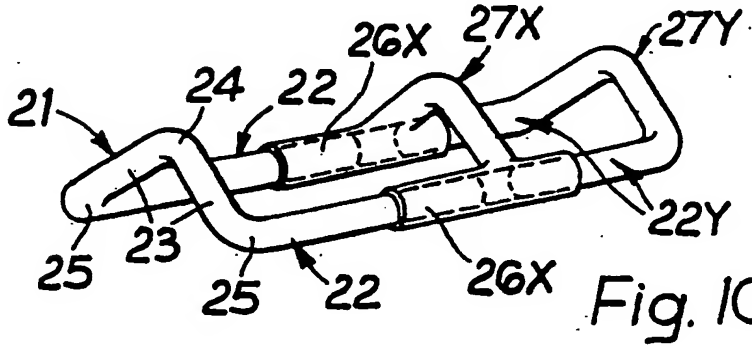

Fig. 10